



## **Electro-Oxidative Conversion and Process Intensification of Biomass derived 5-Hydroxymethylfurfural into 2,5-furandicarboxylic acid**

**Joya, Khurram Saleem; Chatzichristodoulou, Christodoulos; Holtappels, Peter**

*Publication date:*  
2016

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*

Joya, K. S., Chatzichristodoulou, C., & Holtappels, P. (2016). *Electro-Oxidative Conversion and Process Intensification of Biomass derived 5-Hydroxymethylfurfural into 2,5-furandicarboxylic acid*. Abstract from Electrochemical Science and Technology Conference 2016, Nyborg, Denmark.

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



# ELECTRO-OXIDATIVE CONVERSION AND PROCESS INTENSIFICATION OF BIOMASS DERIVED 5-HYDROXYMETHYLFURFURAL INTO 2,5-FURANDICARBOXYLIC ACID

**Khurram S. JOYA<sup>1\*</sup>, Christodoulos CHATZICHRISTODOULOU<sup>1</sup>, Peter HOLTAPPELS<sup>1</sup>**

<sup>1</sup>*Department of Energy Conversion and Storage, Technical University of Denmark (DTU), Frederiksborgvej 399, 4000 Roskilde, Denmark, E-mail: [khsa@dtu.dk](mailto:khsa@dtu.dk), [khurramdtu@gmail.com](mailto:khurramdtu@gmail.com)*

2,5-Furandicarboxylic acid (FDCA) has been recognized among the top ten bio-based chemical feedstocks owing to its use as a precursor in the synthesis of 100% natural, biodegradable and 100% recyclable polymer-plastic PEF (polyethylene furanoate) that will potentially replace the PET (Polyethylene terephthalate). FDCA can be synthesized from easily available and biomass derived 5-hydroxymethylfurfural (HMF) using heterogeneous phase catalysts or electrochemical route (**Figure**). Out of these two processes, the electrochemical route is least explored but it is more viable for the selective formation of FDCA, the selectivity of which can be tuned by electrode potential and by the choice of electrocatalytic material, pH, electrolyte nature, operating temperature and pressure. At DTU-Energy, we have expertise on electrochemical systems operating under ambient pressure and under controlled high-temperature and high-pressure environment. Here we show our electrochemical studies for the HMF oxidation on polycrystalline Au, Pt, Cu and Ni foils, Ti-plate and surface-modified Ti-plate with a RuO<sub>2</sub> film deposited on it. Initial data suggest that polycrystalline gold and platinum surfaces exhibit the lowest overpotential for the HMF (0.5 wt %) oxidation in alkaline media. After product analysis using online HPLC to determine the yield and selectivity, next step is to investigate HMF electrolysis using a wide range of electrocatalytic materials at varying pH under high temperature and high pressure conditions for process intensification.

